

What Is Claimed Is:

- 1 1. An audio conference server (ACS) for enabling an application program
2 to provide multi-point, weight controllable audio conferencing, comprising:
3 means for managing at least one audio conference, said at least one
4 audio conference comprising a plurality of audio clients;
5 means for receiving audio data from said plurality of audio clients;
6 means for mixing said audio data to provide spatialized audio to said
7 plurality of audio clients in said at least one audio conference, wherein said
8 mixing means results in mixed audio data; and
9 means for delivering said mixed audio data to said plurality of audio
10 clients in said at least one audio conference.
- 1 2. The ACS of claim 1, wherein said mixing means includes means for
2 providing distance-based attenuation according to sound decay characteristics.
- 1 3. The ACS of claim 1, further comprising means for checking the status
2 of a registered owner of said at least one audio conference to determine whether
3 said at least one audio conference still exists.
- 1 4. The ACS of claim 3, wherein said checking means includes a resource
2 audit service, said resource audit service operable when said at least one audio
3 conference is generated by a first application and is being used by a second
4 application.
- 1 5. The ACS of claim 1, wherein said plurality of audio clients includes set-
2 top box (STB) audio clients and point source audio (PSA) audio clients.

1 6. The ACS of claim 1, wherein said managing means comprises an ACS
2 shell to allow a user to interactively interface with said ACS, said ACS shell
3 including:

4 means for providing program access to high level methods for creating
5 and managing a proxy audio conference;

6 means for providing program access to methods for creating and
7 managing a plurality of PSA audio clients; and

8 means for providing program access to low level methods for creating
9 and managing said at least one audio conference.

1 7. The ACS of claim 2, wherein said means for providing distance-based
2 attenuation according to sound decay characteristics comprises:

3 means for identifying a decay factor from one of a plurality of pre-
4 defined decay factors and a customized decay factor for each of said plurality
5 of audio clients, said plurality of pre-defined decay factors including

6 an audio big decay factor,

7 an audio small decay factor,

8 an audio medium decay factor, and

9 a constant decay factor;

10 means for determining distances between a target audio client and a
11 plurality of source audio clients;

12 means for determining a plurality of weighted values for each of said
13 source audio clients based on said identified decay factor and said distance
14 between each of said source audio clients and said target audio client, wherein
15 each of said weighted values corresponds to a source/target audio client pair;

16 means for generating a mix table for each of said source/target audio
17 client pairs;

18 means for calculating an actual mix for said target audio clients; and

19 means for refining said actual mix for said target audio clients.

1 8. The ACS of claim 7, wherein said refining means comprises:
2 a gain control function to avoid transmitting excess energy audio data;
3 a fade in/fade out function to avoid the delivery of said audio data in a
4 step-wise manner to a speaker output;
5 a floating point operation elimination function to avoid the performance
6 of floating point multiplication;
7 a mixing adaption function to adapt the actual mix calculation for said
8 target audio client to available CPU resources;
9 a mixing cut-off function to select the nearest talking audio clients for
10 the actual mix; and
11 a stream audio function to prepare stream audio for playing ambient
12 background music or using an audio source forwarded from another
13 conference.

1 9. A method for enabling an audio conference server to provide an
2 application program with multi-point, weight controllable audio conferencing,
3 comprising the steps of:

- 4 (1) managing at least one audio conference, said at least one audio
5 conference comprising a plurality of audio clients;
6 (2) receiving audio data from said plurality of audio clients;
7 (3) mixing said audio data to provide spatialized audio to said
8 plurality of audio clients in said at least one audio conference, wherein
9 said mixing means results in mixed audio data; and
10 (4) delivering said mixed audio data to said plurality of audio clients
11 in said at least one audio conference.

1 10. The method of claim 9, wherein said mixing step includes providing
2 distance-based attenuation according to sound decay characteristics.

1 11. The method of claim 9, further comprising the step of checking the
2 status of a registered owner of said at least one audio conference to determine
3 whether said at least one audio conference still exists.

1 12. The method of claim 11, wherein said checking step includes a resource
2 audit service, said resource audit service operable when said at least one audio
3 conference is generated by a first application and is being used by a second
4 application.

1 13. The method of claim 9, wherein said plurality of audio clients includes
2 set-top box (STB) audio clients and point source audio (PSA) audio clients.

1 14. The method of claim 9, wherein step (1) comprises the step of providing
2 program access to high level methods for creating and managing a proxy audio
3 conference using an ACS shell.

1 15. The method of claim 9, wherein step (1) comprises the step of providing
2 program access to methods for creating and managing said point source audio
3 using an ACS shell.

1 16. The method of claim 9, wherein step (1) comprises the step of providing
2 program access to low level methods for creating and managing said at least
3 one audio conference using an ACS shell.

1 17. The method of claim 10, wherein said step for providing distance-based
2 attenuation according to sound decay characteristics comprises the steps of:

3 identifying a decay factor from one of a plurality of pre-defined decay
4 factors and a customized decay factor for each of said plurality of audio clients,
5 said plurality of pre-defined decay factors including

6 an audio big decay factor,

7 an audio small decay factor,

8 an audio medium decay factor, and

9 a constant decay factor;

10 determining distances between a target audio client and a plurality of
11 source audio clients;

12 determining a plurality of weighted values for each of said source audio
13 clients based on said identified decay factor and said distance between each of
14 said source audio client and said target audio client, wherein each of said
15 weighted values corresponds to a source/target audio client pair;

16 generating a mix table for each of said source/target audio client pairs;

17 calculating an actual mix for said target audio clients using said mix
18 table; and

19 refining said actual mix for said target audio clients, wherein said
20 refining step is used to avoid transmitting excess energy audio data, avoid the
21 delivery of said audio data in a step-wise manner to a speaker output, avoid the
22 performance of floating point multiplication, adapt the actual mix calculation
23 for said target audio client to available CPU resources, select the nearest talking
24 audio clients for the actual mix, and prepare stream audio for playing ambient
25 background music or using an audio source forwarded from another
26 conference.

1 18. A computer program product comprising a computer useable medium
2 having computer program logic recorded thereon for enabling an audio
3 conference server (ACS) to provide an application program with multi-point,
4 weight controllable audio conferencing, said computer program logic
5 comprising:

6 means for enabling the computer to manage at least one audio
7 conference, said at least one audio conference comprising a plurality of audio
8 clients;

9 means for enabling the computer to receive audio data from said
10 plurality of audio clients;

11 means for enabling the computer to mix said audio data to provide
12 spatialized audio to said plurality of audio clients in said at least one audio
13 conferences, wherein said mixing means results in mixed audio data; and

14 means for enabling the computer to deliver said mixed audio data to said
15 plurality of audio clients in said at least one audio conference.

1 19. The computer program product of claim 18, wherein said means for
2 enabling the computer to mix said audio data to provide spatialized audio to
3 said plurality of audio clients in said at least one audio conference includes
4 means for enabling the computer to provide distance-based attenuation
5 according to sound decay characteristics.

1 20. The computer program product of claim 18, further comprising means
2 for enabling the computer to check the status of a registered owner of said at
3 least one audio conference to determine whether said at least one audio
4 conference still exists.

1 21. The computer program product of claim 20, wherein said means for
2 enabling the computer to check the status of a registered owner of said at least
3 one audio conference includes a resource audit service, said resource audit
4 service operable when said at least one audio conference is generated by a first
5 application is being used by a second application.

1 22. The computer program product of claim 18, wherein said plurality of
2 audio clients includes set-top box (STB) audio clients and point source audio
3 (PSA) audio clients.

1 23. The computer program product of claim 18, wherein said means for
2 enabling the computer to manage at least one audio conference comprises
3 means for enabling the computer to provide an ACS shell to allow a user to
4 interactively interface with said ACS, said ACS shell including:

5 means for enabling the computer to provide program access to high
6 level methods for creating and managing a proxy audio conference;

7 means for enabling the computer to provide program access to methods
8 for creating and managing a plurality of point source audio (PSA) audio clients;
9 and

10 means for enabling the computer to provide program access to low level
11 methods for creating and managing said at least one audio conference.

1 24. The computer program product of claim 19, wherein said means for
2 enabling the computer to provide distance-based attenuation according to sound
3 decay characteristics comprises:

4 means for enabling the computer to identify a decay factor from one of
5 a plurality of pre-defined decay factors and a customized decay factor for each

6 of said plurality of audio clients, said plurality of pre-defined decay factors
7 including

8 an audio big decay factor,
9 an audio small decay factor,
10 an audio medium decay factor, and
11 a constant decay factor;

12 means for enabling the computer to determine distances between a target
13 audio client and a plurality of source audio clients;

14 means for enabling the computer to determine a plurality of weighted
15 values for each of said source audio clients based on said identified decay factor
16 and said distance between said source audio client and said target audio client,
17 wherein each of said weighted values corresponds to a source/target audio
18 client pair;

19 means for enabling the computer to generate a mix table for each of said
20 source/target audio client pairs;

21 means for enabling the computer to calculate an actual mix for said
22 source audio clients; and

23 means for enabling the computer to refine said actual mix for said
24 source audio clients.

1 25. The computer program product of claim 24, wherein said means for
2 enabling the computer to refine said actual mix for said source audio clients
3 comprises:

4 means for enabling the computer to provide a gain control function to
5 avoid transmitting excess energy audio data;

6 means for enabling the computer to provide a fade in/fade out function
7 to avoid the delivery of said audio data in a step-wise manner to a speaker
8 output;

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